Spatiotemporal patterns of *Phytophthora megakarya* infections in newly established cacao plantations in Cameroon

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Studying spatial and temporal plant disease dynamics helps to understand pathogen dispersal processes, a necessary undertaking in epidemiology in order to improve disease control recommendations. In this study, plantations devoid of primary inoculum of *Phytophthora megakarya* (causal agent of cacao black pod disease), upon establishment in 2006, were monitored for presence of disease on a weekly basis from 2009 to 2016. Isolates of *P. megakarya* collected in these plantations were genotyped with 14 SSR markers. Ripley's K functions were used to characterize spatial disease dynamics. The univariate K-function was used to describe spatial disease patterns and the bivariate K_{12}-function was used to describe the relation between healthy and diseased cacao trees. Disease distribution maps show aggregated disease patterns in all plots. The K-function confirmed these results although it was not significant in all patterns, probably due to a limited number of diseased cocoa trees. Healthy and diseased cacao trees were mostly negatively correlated, indicating that cacao black pod disease dispersal is a clustered process preferentially affecting neighbors of already infected trees. Based on observations it appears that occurrence of black pod disease is not a complete randomized process. The neighboring environment can greatly influence disease dispersal processes. For instance, closeness to already infected cacao plantations can favor dispersal of disease propagules while the presence of a river can increase the disease incidence and pathogen diversity. According to the results, black pod disease is mainly spread over relatively short distances. Isolation of newly established cacao plantations from infected ones appears therefore to be an effective approach to control black pod.

Keywords: *Phytophthora megakarya*, first infections, spatial pattern, temporal evolution, cacao